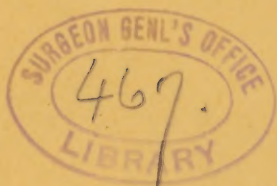


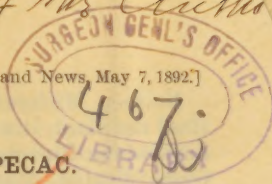
CURRY(G.L.)

AMERICAN IPECAC.



Supplement of the Author

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AMERICAN IPECAC.

BY GORDON L. CURRY, PH. G.*

Gillenia stipulacea, Nutt, and *G. trifoliata* Moench. Natural order: Rosaceæ. Tribe: Spirææ. Synonyms: American Ipecac, Indian Physic, Bowman's Root; Ger., Gelleninwürzel, Fr., Racine de Gillenic.†

According to Gray the name is derived from A. Gille, an obscure German botanist or physician. The title, "Bowman's Root," though applied indiscriminately to both species, is however properly the name of *G. trifoliata*, while in like manner "American ipecac" is the English name for *G. stipulacea*. This genus of plants is but little mentioned in materia medica, indeed but three noteworthy accounts are made, namely, "National Dispensatory," Stille and Maisch, "Organic Materia Medica" of Maisch, and Barton's "Vegetable Materia Medica of the United States." The last mentioned authority being, as far as botanical description and history are concerned, by far the most exhaustive. This work was published in 1817, in Philadelphia, and quoting from page 71, speaking of *G. stipulacea* it reads: ". . . this second well-characterized species fully establishes the validity of Moench's genus, *Gillenia*, and will justify me in restoring it."

* Thesis presented to Louisville College of Pharmacy, 1892.

† Maisch and Stille, National Dispensatory.

Neither Michaux nor Muhlenberg has noticed the plant, it was first described by Willdenow, whom Pursch has quoted. The late Professor Barton observes in his "Collection," speaking of the *spiræa trifoliata*, "It is said that there grows in the State of Kentucky another species which is still more valuable as an emetic than the *spiræa trifoliata*." (Vol. II, p. 39) . . . "There is no doubt that the two species have heretofore been generally confounded under the specific appellation, *trifoliata*, by the American botanists, and indiscriminately used by physicians in the country; though it would seem by Dr. Barton's remark that the circumstances of another species existing in the Western States had been communicated to him with the assurance that this was the more valuable."

Botanical Description. A stout three or four foot perennial herb, stems one to many, somewhat woody and bearing numerous stipulate leaves. Leaves palmately three divided; lobes lanceolate; margin doubly dentate; stipules large, leaf-like, flabelliform and slightly three-lobed.

Calyx: Monosepalous and five-cleft.

Corolla: Pentapetalous, petals adnate to throat of calyx, lanceolate, somewhat unequal, white or tinged with rose, usually white.

Stamens: 10 to 20, short.

Pistils: 5, becoming reddish colored, 2-4 seeded pods in the fruit.

Seeds ascending, somewhat albuminous, and inclosed in a coriaceous covering.

Flowers loosely corymbose or paniced.

Flowering in June and July.*

Rhizome: 2-4 inches long $\frac{1}{4}$ - $\frac{3}{4}$ inches in diameter, much branched, gnarled, and twisted, grayish brown in color, internally lighter, taste very bitter, odor slight and earthy. The exterior surface is marked at intervals with scars of previous years' growth. The bark is somewhat thick, cracking horizontally on drying. When dry the bark may be removed by simply stripping between the forefinger and thumb, exposing a tough, fibrous, woody center, breaking with an uneven fibrous fracture.

Collection. The supply used in my investigations was gathered in Southern Indiana, in a chain of hills (familiarily known as the Knobs) between New Albany and Edwardsville. In its collection I found that by loosening the earth on one side of the plant and inserting the fingers beneath the mass of roots, they could be torn from the soil without the loss of any of the important rootlets; I mention the fact for the benefit of those who wish to collect the plant, and who would perhaps undertake the laborious task of digging the whole of the root in its matted mass from the soil. As a peculiar fact concerning the *G. stipulacea* (I collected only this species) I would remark that, apparently this plant grows more vigorously on the top of a hill, or on the side farthest from the north, indeed I found but few plants on the northern slope of any hill; this peculiarity, however, may be only local. The soil is very

*A few specimens were found in bloom as late as September 5, 1891.

dry during the months of its most rapid growth, June and July, and presumably originates from decay of a soft limestone, many fragments of which are found mixed with it.

Microscopical Structure. The three cortical layers are characterized as follows:

First and outer layer, the epifloam, is made up of cells mostly cubical or flat—rectangular; the latter about three times broader and longer than thick, and filled with a brownish-yellow coloring matter to the depth of from six to ten cells. This coloring matter closely resembles and is probably identical with the contents of the resin cells of the central woody tissue.

The second layer or mesofloam is from 9–15 cells in thickness, the cells being of more irregular outline than those of the previously mentioned layer. They are tabular with two surfaces (inner and outer) flat, but the edges lack the clear-cut squareness, and taper as they approach each other, giving the end view somewhat the appearance of a spindle. The cell content of this layer is colorless and granular, a micro-chemical examination proving it to be starch.

The inner layer of the bark is very thin and apparently merges into the cambium without any great difference of characteristics, the cells presenting the appearance of half-developed cells of the middle bark. The woody portion of the rootlets is of no therapeutical value whatever, and therefore a description will not be given, though an examination was made. It merely contains a few scattered resin cells and some small amount of starch.

Analysis. On drying a specimen weighing 57 grams, first in air and then in an oven at 85° – 100° F., I found that it lost 24.5 grams or nearly 43 per cent (42.9 per cent), while a quantity weighing 7480 grs. with like treatment lost only 35.9 per cent.

Ten grams of the finely comminuted drug left .16 gram on incineration.

Fixed oil: 20 grams of the drug in fine powder was macerated for seventeen days with 200 cubic centimeters of benzene; on the expiration of the seventeenth day the loss by evaporation was made up, and 100 cubic centimeters of the resulting greenish-yellow liquid evaporated. The residue consisted of a fixed oil and a small amount of fatty matter. The oil was greenish-yellow, becoming brown on exposure to the air, showing presence of a probably oxidizable body; the odor was slight and taste bland, and it was easily saponifiable with the caustic alkalis. The total weight of the oil and fat was 0.30 gram, and this was insufficient for a full chemical or even physical examination. As a test for its volatility, several drops of it were placed on note-paper and subjected to a temperature of 212° F. for forty-eight hours with no change whatever, the size of spots remaining constant. Again, 0.20 gram of it was heated in a porcelain capsule for several hours with no decrease in weight. (To verify the freedom of the benzene from any fixed matters, several drops of it were also placed upon paper, but they disappeared in ten minutes without heat.)

The powder, just treated with benzene, was then placed upon a filter and thoroughly washed with the benzene, care being taken to remove all adhering particles of the powder from the sides of the flask. After freeing it perfectly from any remaining traces of the oil or fat by this means, the powder was dried and allowed to macerate for a period of eight days with 200 cubic centimeters of purified ether. On the ninth day 100 cubic centimeters of the resulting yellow liquid was evaporated and found to yield a resinous residue weighing 0.40 gram. At this stage of the operation the residue of a previous maceration of 10 grams of original drug was added, thus making a total of 30 grams of original powder. The weight of this total, after treatment with benzene and ether, was 28.05 grams, showing a loss of weight equivalent to 1.95 grams, this being the amount of soluble constituents dissolved out by these two menstruums.

The ethereal maceration is shown by the following table :

PERCOLATE.	WEIGHT OF RESIDUE.	COLOR.	TASTE.	AMOUNT OF DRUG USED.
200 c. c. Ether.	1.03 gram.	Reddish-brown.	Bitter.	20 grams.

Of 1.37 grams of this ethereal residue (0.07 gram of a previous operation being added) 0.48 gram was soluble in water and 0.89 gram in alcohol. The alcoholic solution contained a bitter resin and some bitter principles.

The aqueous solution produced a darker color on standing, and in a slight degree showed evidences of fermentation. This liquid on evaporation yielded a dark brown residue almost inodorous and very bitter taste. This residue on testing for alkaloids produced negative results; indeed, careful examination for alkaloids, made subsequently, satisfactorily established their absence.

Fehling's solution, however, was decomposed, evincing presence of a saccharine principle, either existing naturally in the plant or the product of the decomposition of some body, probably a glucoside. To determine the identity of this substance the following method was resorted to: Twenty grams of the finely comminuted drug was digested with 200 cubic centimeters of hot distilled water for three hours. The liquid was then strained off and enough distilled water added through the strainer to make 200 cubic centimeters. This liquid was then cooled and filtered, and then shaken with an equal amount of ether. The mixture was then allowed to stand, and when the two layers had separated they were drawn off, one at a time, by means of a separating funnel provided with a stop-cock. The ethereal layer was marked "Ether No. 1," the aqueous, "Aqueous No. 1," and both were set aside for examination.

The ethereal layer was first examined. This was done as follows:

The liquid was placed in a beaker-glass and evaporated at a low temperature, leaving a

small amount of a slightly yellowish crystalline residue. A portion of this residue, on being dissolved in acidulated water, decomposed Fehling's solution very readily. The remainder of the residue was then dissolved in water and treated with ether as before; the evaporation of this resulting ethereal layer yielded a small amount of white, feathery crystals, soluble in water, alcohol, and dilute acids. After boiling with sulphuric acid and treating with Fehling's solution, a reduction of the copper immediately ensued. Other tests for glucosides produced positive results. As the glucosidal nature of these crystals is so clearly depicted they would naturally require a distinctive name, hence I would suggest Gillein.

The reactions of Gillein following are characteristic.

H_2SO_4 red color;
 HNO_3 yellow color;
 H_2CrO_4 deeper yellow.

The aqueous solution marked "Aqueous No. 1" was next examined, and I found that on standing for a few days it had deposited a powdery pinkish substance, which, when filtered out and dried, was scanty, brown in color, and insoluble in alcohol and water. The following are its characteristics:

Precipitate.	COLOR.	TASTE.	ODOR.	H_2SO_4 .	HNO_3 .	H_2CrO_4 .
	Pink then Brown.	Bitter.	None.	Yellow.	Dark yellow.	Greenish-yellow.

The sherry-colored filtrate was then evaporated on a water-bath, and produced a dark brown, somewhat plentiful residue, which on examination showed the presence of sugar, gum, extractive, and a tannin striking a greenish black color, with a solution of ferric chloride. The aqueous layer of the second ethereal treatment was filtered and evaporated on a water-bath at a low temperature. During evaporation the solution acquired a yellowish color, which, however, so far as I was capable of ascertaining, did not seem to indicate any material change of the substances contained. Before heating and during evaporation this aqueous solution produced no reaction with the alkaline copper solution unless previously heated with sulphuric acid (any strong mineral acid, I presume, would have answered), showing the stability of the glucosidal body.

The residue of the above evaporation was taken up in the smallest quantity of distilled water, leaving a reddish and flocculent but not abundant residue, apparently constituting the coloring matter. The whole was then filtered and the clear liquid evaporated to dryness. The result was an amorphous substance, soluble in water, sparingly so in alcohol and ether, and presenting all the reactions of a glucoside.

It does not react with iron salts or gelatine, showing absence of tannin. Sulphuric, nitric, and chromic acids cause no color reactions. This principle is inodorous, slightly yellowish, the taste at first faint, but becoming very bitter in a short time.

As the title of this second glucosidal body I would suggest Gilléenin.

A crude analysis of the plant *G. trifoliata* was made by W. B. Stanhope, a student in the Philadelphia College of Pharmacy, in 1856, and in his writings he makes mention of a principle causing a blood-red color reaction with nitric acid. This fact is conclusive evidence that the two plants so nearly related contain a markedly different principle for, as we have seen, no principle I have found yields a blood-red color with the acid named. I will shortly begin a careful chemical analysis of the principles of both species, and trust to submit my report at an early date.

Action. Gillein, the crystalline glucoside, produced nausea, and almost emesis, when taken in the dose of $\frac{1}{4}$ grain. Had $\frac{1}{2}$ or 1 grain have been taken I feel confident that emesis would have been produced.

Gilléenin, the amorphous glucoside, was obtained in quite a small quantity, hence an authentic statement concerning its properties can not at present be made. I believe, however, that its action will be found to be similar to Gillein. Note is made by Stille and Maisch that the dust of *Cephäelis Ipecacuanha* attacks the mucous membrane of the nose and throat, producing congestion of the larynx and bronchia, causing coughing and sometimes rejection of fibrinous sputum.

In comminuting the *Gillenia stipulacea* the dust arising from it caused, like the aforementioned plant, dryness of the nose and throat

and left a slight congestion of the larynx, which did not wear off for about twenty-four hours. A convenient form of administration will no doubt be secured in the tincture, made 10 per cent in strength with 50 per cent alcohol. Another form, and the one more usually employed, is the decoction. The mention by Barton of this species being the more valuable, as well as its remote use by country folk, would seem to indicate its medicinal value and would warrant a trial by some of the latter-day medical fraternity.

The investigation of this plant was suggested to me first by Professor Otto E. Mueller, of this city, and later by Professor John M. Maisch, of Philadelphia, to whom I wrote for information concerning its historical literature.

This plant has also been of considerable interest to Dr. E. Scheffer, also of this city, and to him as well as to the medical and pharmaceutical profession in general, I trust my investigations will prove of interest.

LOUISVILLE.

